MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2018/2019

HBC1011 – BIOCHEMISTRY I

26 OCTOBER 2018
9:00 -11:00 AM
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This paper consists of **4 pages** (including the front page)
2. This paper consists of **5 Short Answer Type questions**. All questions carry equal marks (10 marks per question).
3. Answer **ALL QUESTIONS.**
4. Print your answers **clearly** and **neatly** in the Answer Booklet provided.
5. You may use calculator in this examination.

Question 1

A. Of more than 100 chemical elements, only about 31 occur naturally in plants and animals. How these elements were selected by primitive life-forms during evolutionary development? Explain your answer with ONE example. [2 marks]

B. What are the THREE fundamental principles which allow the evolution of life to progress? Explain your answer briefly. [3 marks]

C. What is the difference between cohesion and adhesion of the water properties? Illustrate your answer with ONE example. [2 marks]

D. Calculate the ratio of the concentration of acetate and acetic acid required in a buffer systems of pH 4.5 given that the K_a is 1.74×10^{-5}. [2 marks]

E. You need to carry out an enzymatic reaction at pH 7.5. You are given buffer A, B and C with the indicated pK_a values shown in the following table. Which buffer will you use? Explain your answer briefly. [1 mark]

Buffer	pK_a
A	3.1
	4.7
	5.4
B	8.3
C	9.2

Question 2

A. RNA is readily hydrolyzed by alkali, whereas DNA is not. Explain this phenomenon briefly. [1 mark]

B. What are nucleoside and nucleotide analogues? [1 mark]

C. List FOUR chemical forces that stabilize DNA double helix bonds. [2 marks]

D. Why is it usually not important to know the cell types when preparing the genomic library from multicellular organisms? [1 mark]

E. Name ONE method that can be used to detect complimentary DNA sequence. [1 mark]

F. You are given a DNA template. Draw the coding strand and mRNA with the correct orientation. [2 marks]

5'-AGCTGACGCT-3'

G. What does the length of a phylogenetic tree indicate? [1 mark]

H. The three-dimensional structure of protein is more conserved evolutionary than its sequence. Why is this the case? [1 mark]

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Question 3

A. What are stereoisomers? What are the predominant natural forms for amino acids and carbohydrates? [2 marks]

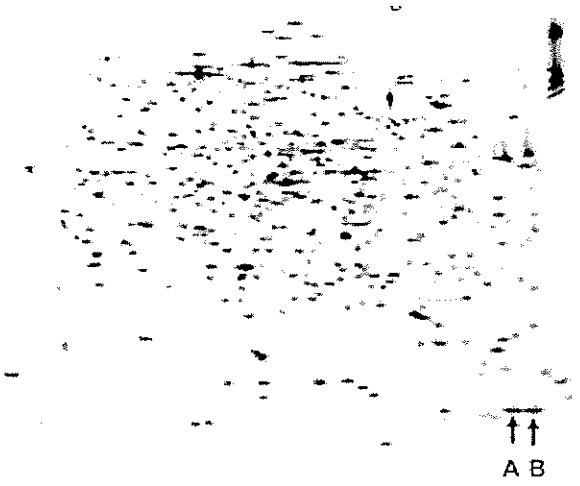
B. What is the function of cysteine in protein structure? Name ONE chemical that can be used to disrupt the protein structure formed by cysteine. [1 mark]

C. Why are almost all peptide bonds in proteins present in *trans* configuration? [1 mark]

D. What is the difference in hydrogen bonding between alpha helix and beta sheet of protein secondary structures? [1 mark]

E. Name ONE method for proteins purification based on their size. [1 mark]

F. Protein A and B are separated using 2D gel electrophoresis. How do proteins separated in 2D gel electrophoresis? Describe the chemical properties of protein A and B based on the observation of gel separation. [2 marks]



G. Name TWO chemicals which may interfere the reaction of protein quantitation assays. [1 mark]

H. What is the application of mass spectroscopy in the study of the proteins? [1 mark]

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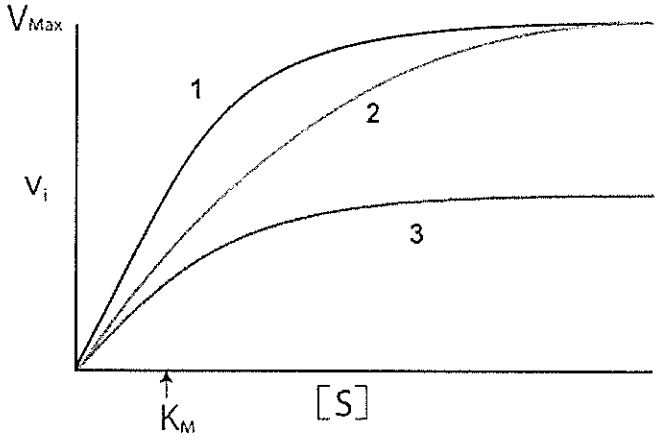
Question 4

A. Study the Michaelis-Menten graph below and identify the curve that corresponds to each reaction listed below.

I. No inhibitor
II. Noncompetitive inhibitor
III. Competitive inhibitor



[1.5 marks]

B. What is a catalyst? List FOUR properties of a catalyst. [5 marks]

C. Define active site of an enzyme. [1 mark]

D. Distinguish between the "lock-and-key" and "induced-fit" models for binding of a substrate to an enzyme. [2 marks]

E. Name ONE covalent modification that regulates enzyme activities. [0.5 mark]

Question 5

A. Suggest a reason why animals that live in cold climates tend to have higher proportions of polyunsaturated fatty acid residues in their lipids than do animals that live in warm climates. [1 mark]

B. Describe the amphipathic properties of membrane lipid. [1 mark]

C. What are gap junctions and their function? [2 marks]

D. List ONE function of Coenzyme Q_{10}. [1 mark]

E. In healthy mammalian tissue, the ratios of NAD^+/NADH and $NADP^+$/NADPH are important to maintain the redox state of a cell. Identify the predominant species in the cytoplasm. [1 mark]

F. What are reducing sugars? Name ONE example and ONE qualitative test for reducing sugar. [2 marks]

G. What is the effect of sugar attachment in erythropoietin? Why is the use of recombinant human erythropoietin banned for athletes? [2 marks]

End of paper